DOCUMENT RESUME

ED 416 071 SE 061 061

| | |
|---|---|
| AUTHOR | Lemons, Judith L. |
| TITLE | Missouri Elementary Science Safety Manual. |
| INSTITUTION | Missouri State Dept. of Elementary and Secondary Education, Jefferson City. |
| PUB DATE | 1996-00-00 |
| NOTE | 49p. |
| AVAILABLE FROM | Assessment Resource Center, 100 Townsend Hall, University of Missouri, Columbia, MO 65211; phone: 800-366-8232. |
| PUB TYPE | Guides - Classroom - Teacher (052) |
| EDRS PRICE | EDRS Price MF01 Plus Postage. PC Not Available from EDRS. |
| DESCRIPTORS | Educational Strategies; Elementary Education; *First Aid; *Hands on Science; *Laboratory Safety; Safety Equipment; *School Safety; Science Curriculum |
| IDENTIFIERS | Missouri |

ABSTRACT

The purpose of this safety manual is to provide a resource to help manage and minimize potential risks in science classrooms where students spend up to 60% of instructional time engaged in hands-on activities. Information on general laboratory safety, science equipment safety, safety with plants, safety with animals, safety with chemicals, field trips, safety equipment, first aid, and legal aspects of safety is included. General guidelines are provided and specific topics are discussed within each section. For example, in the section on science equipment safety, specific guidelines are given for handling glassware, thermometers, heat sources, the sun, lasers, model rockets, batteries, and electrical equipment. (DDR)

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ED 416 071

# Missouri Elementary

# Science Safety Manual

1996

Missouri Department of Elementary and Secondary Education
Robert E. Bartman, Commissioner of Education

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## Emergency Telephone Numbers

Fire Department _____

Police Department _____

Ambulance _____

Hospital Emergency Room _____

Missouri State Poison Control Center ..... 1-800-392-9111
Cardinal Glennon Regional Poison Control Center ... 1-800-366-8888
St. Louis Area .. (314) 772-5200

Local Conservation Agent _____

Cover drawing by

Candis Spraul
Grade 3, Valle Grade School
Ste. Genevieve, MO



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# Missouri Elementary

# Science Safety Manual

Prepared by Judith L. Lemons, Ph.D.,
through a grant from the Department of Elementary and
Secondary Education under authority of House Bill #2.

1996
Missouri Department of Elementary and Secondary Education
Robert E. Bartman, Commissioner of Education

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# Introduction

The National Science Teachers Association Position Statement for Laboratory Science at the Preschool/Elementary Level stresses the need for hands-on experiences for all children. According to the Statement, "A minimum of 60 percent of the science instruction time should be devoted to hands-on activities, the type of activities where children are manipulating, observing, exploring, and thinking about science using concrete materials."

Student and teacher safety must be at the forefront in planning and executing inquiry-based science instruction. In doing hands-on activities, students and teachers are open to more safety risks than those encountered in a passive classroom setting. The purpose of this Science Safety Manual is to provide a resource to help manage/minimize potential risks. Teachers should become thoroughly familiar with the contents of this publication and keep it readily accessible throughout the school year.

This document has been prepared under the careful supervision of competent elementary and secondary science teachers, science supervisors, and university professors. While great care has been taken to ensure the accuracy of its contents, the publication cannot describe every safety issue in every possible educational setting. Safety of students and teachers should be of paramount concern in any science-related activity. Teachers and school officials are encouraged to use this manual as a general guide to safety and as a resource in obtaining more-detailed safety information and training.

C.J. Varnon, Science Consultant, Curriculum Services
Missouri Department of Elementary and Secondary Education



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# General Laboratory Safety

Safety in a science class is a combination of knowledge, preparation, and common sense. Teachers should study and perform a science activity before presenting it to the students so the following three questions may be answered: What is the worst that could happen? How can I prevent this from happening? What will I do if it does happen? This manual was prepared to help answer these three questions by providing funda-mental knowledge about science classroom safety. Resources are provided for further information so teachers may make informed decisions about the possible risks of an activity. With this basic information, a teacher can adapt almost any science activity to provide a safe learning experience.

## Basic Laboratory Guidelines

Because of the supplies and equipment used during science activities, there is an increased possibility of an accident. **Teachers may need to implement additional rules for student behavior in the classroom.** These rules may include:

1. **Wear safety goggles whenever requested by the teacher; it's the law in Missouri!** (see page 31)

2. **Do not eat or drink anything during a science activity.** Keep hands away from the eyes, nose, and mouth. Wash hands with soap and water when an activity is done.

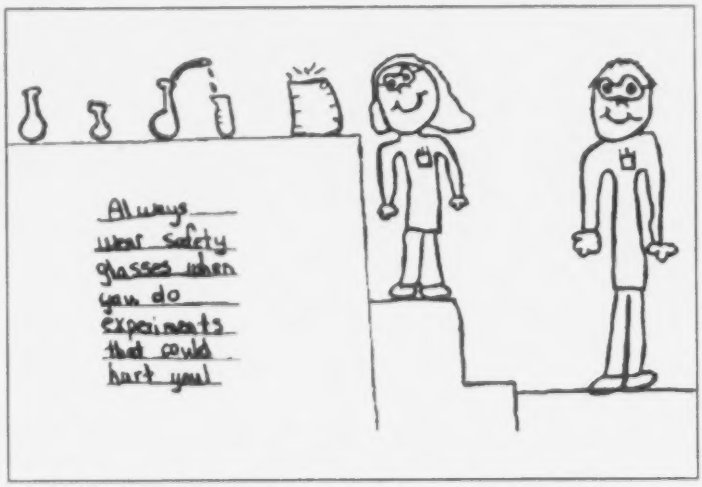
3. **Do not taste, smell, or touch any chemicals or taste any plants without teacher permission.**

4. **Get all supplies at the beginning of an activity.** Consider using small cooperative learning groups, so that only one person per group is responsible for movement of supplies. The fewer students moving around, the safer. Arrange the room so that students have a clear path to supplies.

5. **Know what to do in case of an accident, and be ready to help a lab partner.**

6. **Be very careful with sharp objects.** Be sure to teach your students how to use and carry scissors, pins, and other sharp or pointed objects.

7. **Put all broken glass in a separate bucket or container**. Dispose of other wastes by district policy. Never pick up broken glass with fingers (wear heavy gloves or use a broom).




Jenny Billings, Grade 4, Shepard Blvd. School, Columbia

8. **Do not point either end of a test tube at anyone when heating the test tube.**

Stephanie Taylor, Grade 3, Franklin Smith Elementary, Blue Springs

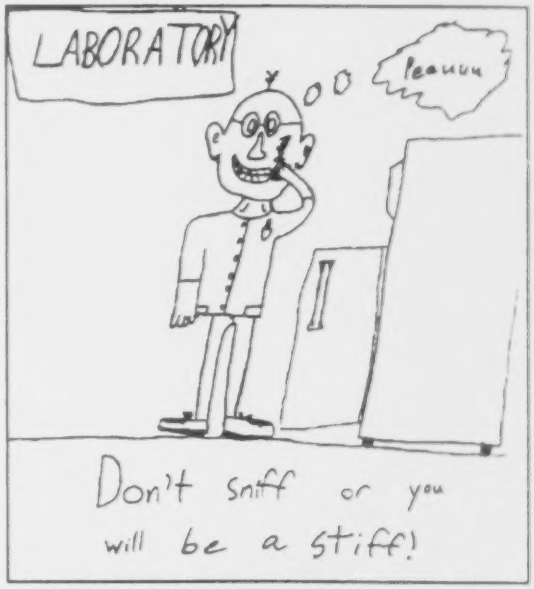
9. **Tie back loose clothing and hair.** This is especially important when working with a heat source or chemicals.

10. **Smell by the "whiff" method, not by putting your nose over the substance!** Hold the container of the substance several inches in front of the nose and use the other hand to wave the fumes toward the nose to smell them.

It is a good idea to post these or other general lab rules for students in the upper elementary grades and to have any specific safety rules printed with the instructions for that activity. Remind the students of any specific safety instructions prior to every experiment, and record these instructions in lesson plans.

A science safety contract or "behavior agreement" is also of value for elementary students. Signing the agreement reinforces personal responsibility for safe actions in the science classroom. It may be of value to have the parent co-sign the agreement. Statements on the contract could include "I will follow all instructions given by the teacher" or "I will stay in my seat during science experiments unless I am the materials manager." Failure to abide by the contract could result in "time out" or a "dry lab" (no hands-on) for that student.

Another option is to include safety as part of the assessment for each activity. This portion of the evaluation could include following directions, staying in the assigned area, working quietly, sharing materials, etc.




Travis Sidebottom, Grade 3, Franklin Smith Elementary, Blue Springs

**Facility Recommendations**

Some schools have dedicated science laboratories, but most elementary science is taught in the general classroom. The facility needs are similar for either situation.

1. **Moveable flat-topped desks or tables are needed for two-four student groupings.**

2. **Adequate spacing is needed for safe student movement.** NSTA does not have any written guidelines for space requirements per student for elementary science classrooms, but Texas recommends 30 square feet of floor space per student and Maryland recommends 35 square feet in general classrooms or 35-40 square feet of space per student in dedicated fixed-table laboratories. NSTA does recommend 5.5 meters (about 59 square feet) of space for combined classroom- laboratories at the secondary level.

3. **In case of emergency, there should be two possible exits from a room.** If on the ground floor, one of these exits may be a window.

4. **Electrical outlets should be easily accessible, be grounded, and have Ground Fault Circuit Interrupters (GFCI's) if within six feet of a water source.**

5. **Space is needed for safe, lockable storage of science supplies.** This includes space for equipment, kits, chemicals, and general materials. Water-resistant counter space or shelving is needed for ongoing investigations, aquariums, animal cages, plants, etc. Bulletin boards are needed for display of science-related materials.

6. **At least one sink with adjacent counter space should be available.** An in-room water supply is very important to an elementary science program. A hot water source is helpful for washing hands as well as for science experiments.

7. **The floor should be easy to clean.** Science is often messy, and a hard-surface floor is recommended for easier clean-up of liquid or solid spills.

8. **Basic safety equipment is required.** At the elementary level, this should include a first aid kit with gloves, an ABC-type fire extinguisher, safety goggles and some method of cleaning the goggles, and a water source for an eye wash station (or milk jugs of water if there is any possibility of need). In a dedicated science room, there should also be a fire blanket and an additional consideration for ventilation. Depending on the type of teacher activities, a demonstration safety shield may also be of value.

9. **Science classrooms should have windows and, if possible, access to the school grounds.** Daylight is needed for plant growth and allows the students to observe properties of light and shadow as well as seasonal changes.

In the dedicated science laboratory, additional sinks and GFCI-protected electrical outlets at each work station limit the amount of student traffic. These features also reduce opportunities for spills, tripping over cords, and other accidents.

**Safe Science For Handicapped Students**

The study of science is based upon the use of all the senses, making possible a rewarding experience for almost every child. A child with a visual or physical impairment can participate in most activities with only minor adjustments necessary. The safety suggestions for students with disabilities are valid for every child.

1. **A buddy system has been found to be effective.** For example, pair a hearing-impaired student with a hearing classmate; let both partners share safety responsibilities.

2. **Encourage any visually impaired student to visit the classroom before classes start.** This allows the student to become familiar with the layout of the room.

3. **Make sure all students are following the safety rules.**

4. **Classroom aisles should remain clear for student traffic.** Physically handicapped students should be near an easily accessible exit.

5. **Be sure every student understands the directions for the experiment.** Make sure the hearing impaired student can see you as you speak and has printed directions. Be sure the visually impaired student has heard what you have said; read aloud directions as you write on the blackboard, etc. Taped or braille instructions may also be of value.

6. **Have visual flashing-light alarms for students who are hearing impaired.**

7. **All students should wear safety eyewear as required by law, and lab aprons should be available.** A handicapped student may not be able to respond quickly to an accident such as a spill or broken glass, so personal safety equipment is especially important.

SAVI/SELPH is an interdisciplinary multisensory science enrichment program funded by the U.S. Office of Education to research the use of hands-on science in mainstream situations. Science Activities for the Visually Impaired (SAVI) and Science Enrichment for Learners with Physical Handicaps (SELPH) have developed specialized equipment and activities for impaired, handicapped, and disabled students. Though originally designed for students in grades four through seven, the SAVI/SELPH activities have been used from first through tenth grade. These programs present an excellent learning experience for *any* student in a hands-on program, often increasing understanding beyond that obtained through a standard approach.

For more information about SAVI/SELPH, contact:

SAVI/SELPH
Center for Multisensory Learning
Lawrence Hall of Science
University of California
Berkeley, CA 94720
Phone: (510) 642-8941
Fax: (510) 642-1055

Elise Frazier, Grade 4, Forest Park Elementary, O'Fallon

# Science Equipment Safety

## Glassware

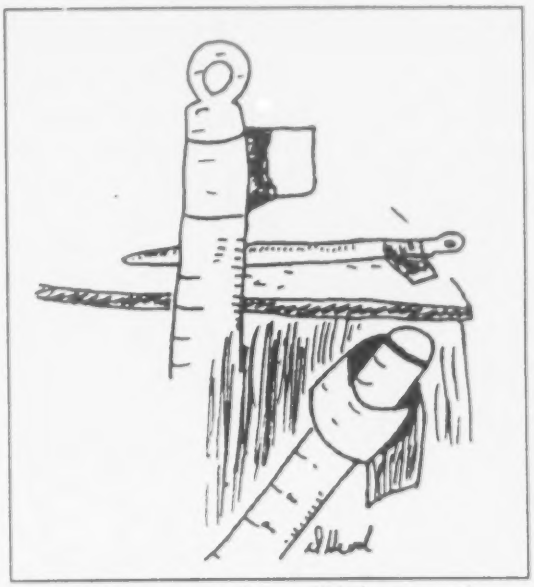
1. **Replace glass equipment with unbreakable plastic whenever possible.** If glass is used, make sure there are no cracks or chips. Sharp edges on mirrors and prisms may be smoothed with emery cloth or Carborundum stone (both available from hardware stores), wrapped with tape, or if appropriate, painted with quick-drying enamel. Have a special storage container only for waste glass.

2. **Do not allow students to attempt to insert glass tubing or thermometers into stoppers**. *This process is the leading cause of accidents in the science lab.* If possible, substitute clear plastic tubing or straws for the glass tubes. If strong, rigid tubing is needed, try using clear plastic balloon sticks.

## Thermometers

1. **Thermometers are easily broken, so alcohol or hexane thermometers (the ones with the red liquid in them) are recommended over mercury thermometers (with the silver liquid).** Mercury readily vaporizes and is a dangerous poison; if mercury is spilled, do not allow anyone to touch it, and open windows and doors for maximum ventilation. Wear gloves and either scrape the mercury into a heavy-duty seal-lock plastic bag or pick it up with a plastic syringe bottle. Do not try to sweep it up with a broom or a vacuum cleaner. Special "mercury sponges" are available at a low cost for more thorough cleanup of small spills. Mercury should be disposed of as a hazardous waste. Do not put it in a trash can; send the mercury through school mail to the district chemistry teacher.

2. **To reduce thermometer breakage, use the ones which are wired to a plastic or metal backing.** Anti-roll, triangular tip thermometers are also available, or you can make a "flag" on the end of the thermometer using a piece of tape which will help prevent rolling. Do not allow thermometers to be used as stirring rods, and do not apply direct heat to the bulb.



A "flag" made out of tape will help prevent the thermometer from rolling off the desk.

## Heat Sources

1. **Place candles in aluminum pie pans. Secure the candle by dripping melted wax onto the pan and placing the candle on that wax**. Surround the candle with wet sand for maximum security. If possible, avoid the use of *any* open flames with primary students.

2. **Use smooth-surface hot plates (as opposed to hot plates with exposed coils) if**



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**at all possible for a heat source.** These hot plates will probably have to be ordered from a lab supply company. Efforts should be made to minimize need for individual heat sources for elementary students.

3. **Alcohol burners can be very dangerous.** If alcohol burners must be used:

a. Use broad-based burners so they won't tip as easily.
b. Check for cracks, chips, etc., and fill prior to student use. Use a plastic squeeze-type bottle to refill. Don't fill a burner until it has cooled. Use only ethyl alcohol or a designated burner fuel. **Duplicating fluid is not recommended (see page 27), and NEVER use kerosene or gasoline.**
c. Add a pinch of salt to the alcohol in the burner so the flame can be seen.
d. Caution students to push their sleeves up, tie back their hair, and never reach over the burner.
e. Be sure a functioning "ABC" type fire extinguisher is in the immediate area.

Holly Shay Ochoa, Grade 5, Hawthorne Elementary, Mexico

## The Sun and Other Light Sources

1. **Avoid direct viewing of the sun.** It is very difficult to view an eclipse with children. They often find it almost impossible not to glance at the partially blocked sun. Even with the sun's brightness lessened, there are still sufficient direct ultraviolet rays striking the retina of the eye to cause permanent damage. The retina does not feel pain, and symptoms of damage may not appear for several days. Lunar eclipses present no hazard to the eyes.

Indirect method for viewing an eclipse

**Method for safely viewing a solar eclipse**

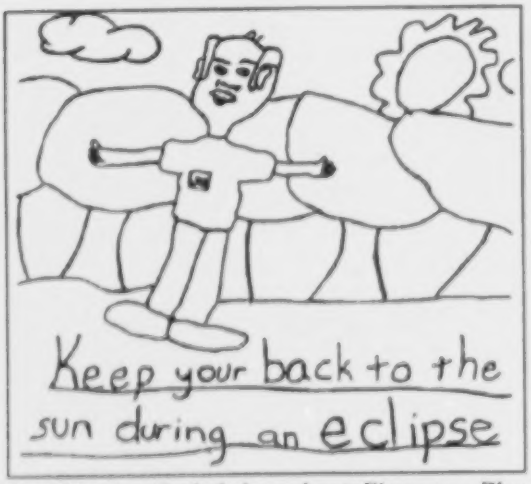
The safest method is to watch the eclipse on television. If the children go outside, the National Society to Prevent Blindness recommends the following indirect method:

a. Get two sheets of white cardboard (such as index cards).

b. Make a pinhole in the center of one of the sheets.
c. Hold the sheet with the hole in it so that the sun shines through that hole onto the cardboard held in the other hand in front of you.
d. Adjust the pieces of cardboard to obtain the desired image size (change the distance between the sheets).
e. Look at the sheet in front of you and see a projected image of the sun as the moon slowly crosses in front of it.

A large box placed over the student's head may be used in a manner similar to the index cards (with a pinhole placed on the back side of the box) and is probably even safer than the cardboard method for young students.

Smoked glass, exposed film, and welder shields do not provide a safe filter from the sun. There are safe indirect methods using a telescope. The safety of sun filters on telescopes should be carefully evaluated for use with elementary students.




Jared Morales, Grade 3, James Lewis Elementary, Blue Springs

2. **Do not use the sun as a direct source of light for light-gathering or reflecting devices such as mirrors, microscopes, or magnifying glasses.**

3. **Be careful with lamps, which may get hot.** Try to place the lamp so students cannot make accidental contact with the hot part of the lamp during experiments.

**Lasers**

Students expect lasers to be severely damaging to people and all other objects. When guidelines are followed, however, lasers are safe for classroom use. The Class I laser recommended for elementary use is generally considered completely eye safe. A Class I laser emits less than 0.39 microwatts of continuous energy, with Classes II-IV emitting higher levels of energy. Class II and IIIa lasers may be found at the high school level classroom, but could produce eye damage after direct, long-term exposure. Any laser with more power than Class I is not recommended for use with young children unless the teacher has taken a laser safety course.

Though Class I lasers are considered eye safe, the following guidelines are recommended:

1. **Never allow a student to look into a laser.**

2. **Prisms and mirrors should be set up in advance to avoid unexpected reflections from the laser beam.**

3. **Be careful to avoid other accidental reflections.** Rings, watches, necklaces, wall mirrors, etc. should be removed before using a laser.

4. **If a beam stop is used, be sure it is not reflective or flammable.** One of the most common beam stops is a flat piece of carbon, available at industrial lighting stores.

5. **Be sure the laser cord is grounded.**

6. **Safety goggles are a good idea, though not required with Class I lasers.** These goggles are special glasses that are rated for the wavelength and power of a particular laser, and are not automatically interchangeable between lasers. This is a totally different type of safety goggle than that required for work with chemicals.

## Model Rockets

1. **A Model Rocketry Safety Code should be available from the source selling the rockets.**

2. **Rockets with a class A or smaller engine are strongly recommended, and only factory-prepared solid propellent engines should be used.**

3. **Use remote control and electrically operated launching systems.** Be sure the launch rod is securely anchored to the ground.

4. **Keep all students a safe distance from the immediate launch area.** The distance depends upon the size of the rocket and engine, but 15 feet may serve as a guideline.

5. **Launch the rockets in clear areas in calm weather conditions.** Always carefully check wind direction and speed.

6. **Never attempt to recover a rocket from power lines or other dangerous places.**

7. **Check local regulations before launching rockets.** Check with the nearest air traffic control facility, if applicable, as well as the fire department and city codes.

## Batteries

1. **Miniature "button" batteries present a risk of poisoning if swallowed.** This is the type of battery used in calculators, watches, cameras, etc. These batteries can cause internal burns if they become lodged in the esophagus or intestinal tract, and a Poison Control Center or the National Button Battery Ingestion Hotline (202-625-3333) should be contacted if this situation arises.

2. **Dispose of all leaking batteries**. Ask the janitor what to do with them. Carefully clean all places the leaking battery touched with soap and water.

3. **Do not store batteries where they may roll around and accidentally touch metal.** Fires have resulted from such contact. Batteries may be stored in the refrigerator to extend their useful life.

4. **Do not try to recharge any battery not specifically designed to be recharged as an explosion may result.** Read the battery label carefully to be sure that the battery may safely be recharged.

5. **Do not try to heat a battery to make it work better.** It may explode.

6. **Lead storage batteries are not recommended for use in the elementary school.** They contain corrosive sulfuric acid (and may be called acidic batteries), and deliver enough current to cause wire insulation to ignite.

7. **Caution students about hot wires connected to batteries.** Be sure to use insulated wiring, and be aware that "D" and lantern-type batteries can create a hot wire in a short time. Tell your students to keep the circuits open (partially disconnected) as much as possible.

## Electrical Equipment

1. **Make sure hands are dry when using any electrical equipment.** Wet skin reduces resistance and greatly increases the chance of shock. Do not place any electrical appliance near a source of water (such as a fan on a sink). Beware of wet floors near electrical appliances.

2. **Ground Fault Circuit Interrupters (GFCI) are highly recommended for further protection against serious shock.** GFCI protect by limiting the duration of the shock, preventing serious injury for normally healthy persons. GFCI are required by Missouri law in outlets within six feet of a water source in all new construction, and should be utilized in all school electrical outlets near water. Ground Fault Circuit Interrupters are available for individual outlets or for circuit breaker boxes for entire circuit protection.

3. **Avoid the use of extension cords if at all possible.** If used, tape electrical cords down to the floor or use an extension cord cover (available at most hardware stores) to avoid tripping accidents.

4. **Be sure that everyone pulls the plug, and not the cord, to remove the cord from an outlet.** Students should also be cautioned never to touch the metal prongs when plugging in a cord. Touching both prongs as they enter the outlet could cause the child to become part of a short circuit, creating a very serious electrical shock. A person may also receive a shock by touching the prong as it enters the "hot wire" part of the outlet.

5. **All cords should have three-prong plugs to reduce the chance for electrical shock. Electrical cords should be checked for damage each time an appliance is used.** Grounded plugs are supposed to divert hazardous current into the ground, but will not work if the wire is broken or the contact is not firm. An electrician or school maintenance personnel can inspect cords for safety, and the teachers should check for frayed insulation or bare wires on a regular basis.

Scott Shipman, Grade 4, Franklin Smith Elementary, Blue Springs

6. **Use extreme care with electric heat and light sources for aquariums.** Be sure to unplug systems before working with the aquarium.

7. **Be sure to stress that students should not experiment with electricity at home and should never play with an electrical outlet.**



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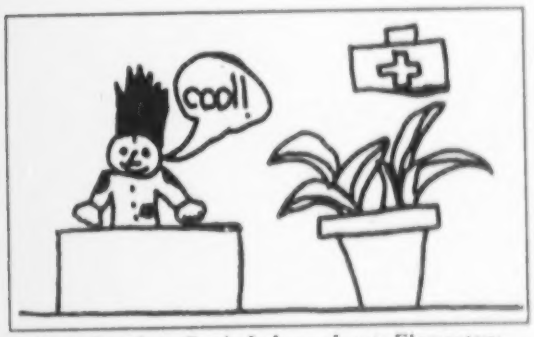
# Safety With Plants

Plants are a positive addition to any classroom environment. They are usually easy to care for and are an integral part of learning through all the process skills. Teachers should be familiar with all plants in the classroom and on the school grounds. Plants which contain toxins (poisons) should not be present in the classrooms of small children. See page 16 for a list of some of the plants which may create problems. Reactions to plant toxins depend on personal sensitivity and amount of exposure; *the majority of the plants listed present a problem only if large amounts are eaten and the student has a sensitivity to the toxin.*

## General Guidelines

1. **Know your plants**. Never eat any part of an unknown plant, whether in the classroom or on a field trip. Help the students understand the difference between edible and non-edible plants, vegetables, and fruits.




Justin Pacubas, Grade 3, James Lewis Elementary, Blue Springs

2. **Wash hands after handling plants, before plant residue can be rubbed into eyes or onto skin, and especially before eating.**

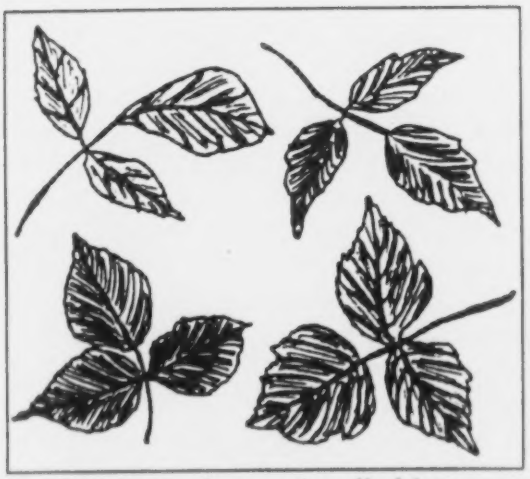
3. **Avoid pink seeds and other seeds which are used for garden or field planting and may have been treated with chemicals.** Most of the chemicals used would irritate sensitive skin and be poisonous if eaten. Beans and seeds from the grocery store or those specifically packaged for sprouting will be safe to handle and germinate. A good source of seed mixtures is a box of parrot mix or gerbil treat. Be sure to avoid poisonous castor beans.

4. **Be aware of allergies**. Many people are allergic to pollen or mold. Try to keep contact with pollen to a minimum for these students with allergies. Keep molds in sealed containers.

5. **Store insecticides, fertilizers, and other plant chemicals in locked cabinets or rooms.** Wash hands well after use of these chemicals.

6. **Beware of mushrooms.** Mushrooms may grow on the school grounds or be found on field trips. Mushrooms are not plants, but are the fruiting body of a fungus. Some are safe to eat while others contain deadly poisons. Some poisonous mushrooms are commonly called toadstools. "*Edible and Poisonous Mushrooms*," a free booklet available from the Missouri Department of Conservation, is an excellent source of color pictures and information.

7. **Beware of poison ivy**. Poison ivy may be found on school grounds or during field trips. Remember "Leaves of three, let it be." Poison ivy or oak may have a variety of leaf shapes,



Poison ivy may have a variety of leaf shapes, but there are always three leaves.

grow as a trailing or climbing vine or shrub, and may grow in almost any combination of conditions in Missouri. An information booklet entitled "*Poison Ivy, Poison Oak and Poison Sumac*," published by the USDA, is available from the local Missouri University Extension Office. "*The Baneful Weeds*" and *"Poison Ivy"* are free pamphlets from the Missouri Department of Conservation. The address for the Conservation Department is given on page 43. Many of the Department publications are available from the local Conservation Agent.

8. **Protect the students and the environment from any microorganisms grown in the classroom.** Be careful with cultures of fungi, mold, and bacteria. Seal petri dishes by taping around and across the dishes before passing them around for observation. Grow bread mold in sealed containers such as heavy seal-locked bags, and do not allow the students to open them for observation. Kill the petri dish cultures before washing or disposal. Cultures that are known to be safe may be soaked in a strong disinfectant such as Lysol for 24 hours before being washed or thrown away. Unknown cultures, such as those gathered from water fountains or floors, may be killed by heating in a pressure cooker or autoclave for 20 minutes at 15 pounds/square inch of pressure. Carefully follow autoclave instructions. If using a pressure cooker, turn off the heat, remove the cooker from the heat source, and allow the pressure to reduce gradually to normal air pressure. Open the stopcock, wait for the hissing to stop, and lift the cover so it is tilted away from the teacher to give protection from any remaining heat and steam.

9. **Be careful about using pond water**. Pond water is often studied for identification of many microorganisms, and has been known to make students and teachers ill. Try to limit physical contact with the pond water, and be sure to wash hands with soap and clean water when finished. Disinfect all equipment.

Bobby Canfield, Grade 2, Southwood School, Raytown

**Poisonous Missouri Plants**

There are hundreds of relatively common plants in Missouri which may cause symptoms ranging from skin irritation to vomiting to convulsions or death in sensitive individuals. The best protection is to know about the plants the students will contact, make sure the

students do not ingest any part of the plant without permission, and always have them wash their hands well after handling plants. The Missouri Department of Conservation sells the book *Wild Edibles of Missouri* for less than $5.00. This book also includes information about non-edible plants and has several pages of color plant pictures to aid in identification. For further information about Missouri plants, contact:

Tim Smith
State Botanist
Missouri Conservation Department
P.O. Box 180
Jefferson City, MO 65102-0180

In addition to the information listed on the next page, some plants cause photo dermatitis when large amounts are eaten and the individual is highly sensitive. Photo dermatitis occurs when an individual encounters a noxious chemical and is then exposed to sunlight. The result is a sunburn-like rash that is often diagnosed as poison ivy. Plants known to cause photo dermatitis include dill (Anethum), celery (Apium), carrot (Daucus), fennel (Foeniculum), parsnip (Pastinaca), St. John's wort (Hypericum), mustard (Brassica), and dittany, or the gas plant (Dictamnus).

## Missouri Plant Information

**This represents only a partial listing of toxin-containing plants in Missouri. Symptoms will vary depending on amount of exposure and student sensitivity. <u>The possible risk is through ingestion, unless otherwise noted.</u>**

| PLANT | POISONOUS PART | SYMPTOMS |
|---|---|---|
| Apple | Seeds | Breathing difficulty, spasms, coma, death |
| Buckeye | Leaves, flowers, sprouts, nuts | Vomiting, diarrhea, weakness, dilated pupils, depression, paralysis |
| Caladium | All parts | Intense burning of mucous membranes, may cause swelling of tongue and throat to block air passage |
| Castor bean | Seed | Severe vomiting, diarrhea, convulsions, kidney damage, death; highly poisonous |
| Daffodil | Bulb | Vomiting, diarrhea |
| Dieffenbachia | All parts | Intense burning and mouth irritation; swelling may block air passages; known as "dumb cane" |
| English ivy | Berries and leaves | Stomach pains, diarrhea, difficult breathing |
| Four o'clock | Roots and seeds | Vomiting, diarrhea, abdominal pain |
| Foxglove | Leaves | Vomiting, diarrhea, headache, irregular heartbeat, genus *Digitalis* |
| Holly | Berries | Vomiting, diarrhea, central nervous system depression |
| Hydrangea | Leaves and buds | Vomiting, diarrhea, gasping, rapid breathing |
| Iris | Rhizome, flower stalks, leaves | Vomiting, diarrhea, blisters of lips and mouth |
| Jack-in-the-pulpit | Rhizomes | Dermatitis |
| Japanese yew | All parts, especially the seeds | Vomiting, diarrhea, dilated pupils, convulsions |
| Jimson weed | All parts | Thirst, dilated pupils, flushing, hallucinations, headache, nausea |
| Jonquil or narcissus | Bulb | Vomiting and diarrhea |

| | | |
|---|---|---|
| Lily of the Valley | Leaves and flowers | Vomiting, irregular heartbeat |
| Mayapple or mandrake | Green fruits, roots and foliage | Vomiting and diarrhea |
| Milkweed | Leaves, stems and sap (*can be irritating to skin)* | Stomach and intestinal upset, possible skin irritation |
| Mistletoe | Berries | Acute stomach and intestinal irritation, diarrhea, slow pulse |
| Nightshade | All parts | Vomiting, diarrhea, convulsions, respiratory and nervous system depression |
| Osage Orange | Milky juice *(by contact)* | Dermatitis, blistering possible |
| Philodendron, split leaf | Leaves | Burning of mouth, vomiting, diarrhea |
| Poinsettia | Leaves, stems, flowers | Not highly toxic as once thought; recent studies indicate that it may cause some gastric irritation and burning of the mouth (Source: U.S. Consumer Product Safety Commission and Poison Prevention Council, 1996) |
| Poison Ivy or Oak | Sap from all parts (*by skin contact, by ingestion, and airborne for very sensitive persons)* | Blisters, itching, ingestion may cause serious irritation and swelling |
| Pokeweed | All parts | Vomiting, diarrhea, abdominal pain, respiratory depression, convulsions, death |
| Potato or tomato | Leaves | Cardiac depression |
| Privet | Leaves and berries | Vomiting, diarrhea, low blood pressure, kidney damage |
| Rhododendron | All parts | Nausea, vomiting, dizziness, breathing difficulty |
| Rhubarb | Leaves | Burning of mouth and throat, vomiting, diarrhea |
| Stinging nettle | Stinging hairs (*by contact)* | Dermatitis, itching |
| Sweet pea | Seeds | Slow or weak pulse, shallow breathing, paralysis, convulsions |
| Trumpet creeper | Leaves, flowers *(by contact)* | Dermatitis |
| Virginia creeper | Berries | Vomiting, diarrhea (deaths reported) |
| Wild parsnip | All parts *(by contact)* | Dermatitis |

# SAFETY WITH ANIMALS

Animals are used in the classroom to help students gain an understanding of and respect for the life processes. Teachers may help students develop a positive attitude toward animals by focusing on the uniqueness of each animal and its relationship to the environment. Local school district policy should be followed about bringing any animal into the class room. *Classroom Creature Culture: Algae to Anoles* by Hampton, Hampton, and Kramer (NSTA, 1986) is a good source for information regarding the care of living organisms in the elementary classroom.

## General Guidelines

1. **Teachers have primary responsibility for the care of living animals in the classroom.** Arrangements must be made for adequate daily care, including weekends and vacation periods.

Bradley Nelson, Grade 3, James Lewis Elementary, Blue Springs

Shelly Blair, Grade 5, Hawthorne Elementary, Mexico

2. **The comfort of animals should be a prime concern.** Basic needs include gentle handling, proper feeding, sanitary living quarters, and appropriate environmental conditions (heat, space, etc.). Help students understand that animals should not be disturbed when eating. Any study involving pain should be avoided.

3. **Be aware that some students are allergic to guinea pigs, hamsters, and other fur-bearing animals.**

4. **Students should not insert fingers into animal cages.** Mammals protect themselves and their young by scratching or biting. If the young are to be handled, the mother should be moved to another cage as she will be very protective.

5. **Students should wash hands after handling animals.**

6. **Purchase healthy animals from reliable sources.** Infected animals can be a continuous

low-level source of contamination to students. Do *not* allow students to take unhealthy animals home.

7. **Discourage students from bringing personal pets to school.** If pets are brought into the classroom, they should be handled only by their owners. Provision should be made for animal care during the day by providing a place to rest and water to drink. Any pet brought to class should have a clean bill of health from a veterinarian.

8. **Allow new animals in the classroom a few days to adjust to the unaccustomed environment before the students handle them.** This also allows time for most symptoms of animal disease to become obvious.

9. **Behavioral studies should use only reward (such as food) and not punishment in training programs.**

10. **Dissection is not recommended for elementary students.** Alternatives include:

a. fashioning organs out of modeling clay and assembling the organs in correct anatomical relationships
b. anatomical models which may be taken apart and rebuilt
c. anatomy coloring books
d. interactive computer programs
e. teacher demonstrations

Mary Alderson, Grade 1, Franklin Smith Elementary, Blue Springs

More information is available from the National Association for Humane and Environmental Education, P.O. Box 362, East Haddam, CT 06423-0362, (203) 434-8666 or from science supply catalogs and NSTA publications.



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## Physiological Data for Common Laboratory Animals*

**This information is offered as a guideline for care of animals in the classroom.**

| **Animal (female)** | **Rabbit** | **Rat** | **Mouse** | **Guinea Pig** | **Hamster** |
|---|---|---|---|---|---|
| Breeding life (yrs) | 1-3 | 1 | 1 | 3 | 1 |
| Gestation period (days) | 31 | 21 | 20 | 68 | 16 |
| Duration of estrous cycle (days) | 15-16 | 4-5 | 4-5 | 16-19 | 4 |
| Duration of estrous (days) | 30 | 1 (6 hrs) | 1 (3 hrs) | 1 (6-15 hrs) | 1 (4-23 hrs) |
| Litter size | 1-13 | 6-9 | 1-12 | 1-8 | 1-12 |
| Weaning age (wks) | 8 | 3-4 | 3 | 2-3 | 3-4 |
| Breeding age (mos) | 6-7 | 2-3 | 2 | 3 | 2 |
| Birth weight (gm) | 100 | 5-6 | 1.5 | 75-100 | 2 |
| Weaning weight (gm) | 1000-1500 | 40-50 | 10-12 | 250 | 35 |
| Eyes open (days) | 10 | 10-12 | 11 | Birth | 15 |
| Body temp (°C) | 39.4 | 38.2 | 37.4 | 38.6 | 38.0 |
| Resp. rate (breaths/min) | 53 | 85 | 160 | 90 | 83 |
| Heart rate (beats/min) | 200 | 328 | 600 | 300 | 450 |
| Blood pressure (mm Hg) | 110/80 | 130/90 | 120/75 | 77/50 | 108/77 |
| Adult daily water intake (ml) | 300 | 35 | 6 | 145 | 30 |
| Adult daily food intake (gm) | 180 | 10 | 5 | 12 | 10 |
| Adult metabolism (cal/Kg/day) | 110 | 130 | 600 | 100 | 250 |
| Environmental temp. range (°F) | 60-72 | 65-75 | 68-78 | 65-75 | 65-75 |
| Relative hum. (%) | 45-50 | 45-50 | 45-50 | 45-50 | 45-50 |
| Floor space/animal (sq.ft) | 2-5 | 0.4 | 0.4 | 0.7 | 0.34 |
| Adult body wt. (kg) | 3.7 | 0.45 | 0.035 | 0.43 | 0.12 |
| Life span, ave. (yrs) | 6 | 3 | 1.5 | 3 | 1 |

* Information compiled by Cynthia Besch-Williford, D.V.M., Ph.D., Associate Director, Research Animal Diagnostic and Investigative Laboratory, University of Missouri - Columbia

## Wild Animals

Wild animals do not make good pets and are not recommended for use in the classroom on a general basis. They transmit diseases to humans and often exhibit unpredictable behaviors. Wild animals may require highly specialized care, and as they mature can become dangerous to handle and damaging to property. The Missouri Department of Conservation offers the following information:

1. **Baby animals are rarely abandoned**. Many times the parent animal is afraid to show itself when people are near, or may simply be out hunting food. If the baby is left alone, the parent will usually return. Even baby birds which have fallen from a nest will continue to receive parent care if the baby is carefully returned to the nest.

2. **A wild animal that has been declawed, defanged, or descented will not be accepted by a zoo and will die if released to the wild.**

3. **Mites, ticks, lice, flukes, roundworms, rabies, distemper, tuberculosis, respiratory diseases, and skin diseases caused by a fungus are carried by native wildlife**. Some of the diseases can be transmitted to humans.

4. **Bird nests are full of disease-carrying organisms and are illegal to take.** Students should be discouraged from touching nests in the spring and summer when the parasite problem is greatest. Nests found in the late fall or winter after the birds are gone will be somewhat safer but still infested. The safest method to handle nests is to put them in a see-through seal-lock bag. Make sure hands are thoroughly washed after handling nests.

5. **Bird eggs are protected by state law and should not be taken.** The shells of eggs are generally safe to handle after thorough disinfecting, but unhatched eggs will rot and can explode from the interior build-up of gases. This will produce very unpleasant odors. It is best to keep the eggs only one or two days.

6. **Wild animals are protected by law**. It is illegal to possess many wild animals without a valid state or federal permit. The *Wildlife Code of Missouri*, Chapters 4 and 9, contains detailed information but it may be easier to contact the local conservation agent with specific questions as to what is legal and safe. Conservation department representatives can also provide suggestions for care and release of the animal back to the wild after it has been studied.

A Wildlife Collector's Permit is required for any teacher or student who collects or possesses wildlife for scientific research purposes. The permits may be issued to professionally qualified individuals for specified projects. Valid permits are also required for bird banding and for rehabilitation of any sick or injured wildlife.

### Wildlife in the classroom

**In spite of state regulations, students will bring animals, nests, and eggs into the classroom. What should the teacher do?**

Teachers should be aware that collection of animals, including their young, eggs and nests, is regulated by federal and state law. Special scientific collection permits may be necessary for those species which fall under the jurisdiction of the *Wildlife Code of Missouri*. According to Chapter 9 of the Code (1996), Missouri citizens may confine or keep up to five non-migratory native wildlife speci-

mens provided they are not game species, considered dangerous to humans, or endangered (Code, Chapter 4).

The Missouri Department of Conservation offers help to teachers through the local conservation agent and through education consultants. The Missouri Department of Conservation (P.O. Box 180, Jefferson City, MO 65102) has an excellent collection of materials and films for use in schools. Parks and Recreation personnel, where available, may also be good sources of information.

## Venomous Animals and Insects in Missouri

1. **There are five species of venomous snakes generally found in Missouri.** The majority of snakes in Missouri (88%) are harmless. The venomous snakes include the Osage Copperhead, the Western Cottonmouth (water moccasin), the Eastern Massasauga Rattlesnake (swamp rattler), Western Pygmy Rattlesnake (ground rattler), and the Timber Rattlesnake. The *Snakes of Missouri* booklet from the Department of Conservation has color pictures of these as well as of the common harmless snakes.

If a snake is unexpectedly encountered on the school grounds or while on a field trip, the safest approach is to back away from the snake or allow it to move a good distance before advancing further on the trail. The pamphlet *Snakes and People* by T. Johnson from the Department of Conservation has more information about snakes and human interactions. Teachers may contact the St. Louis Herpetological Society (see page 43) for further information.

2. **Wasps, bees, hornets, and mud daubers are often found on school grounds.** The publication *Common Missouri Wasps and Bees* from the Department of Conservation is free of charge and has pictures and information about common wasps, mud daubers, velvet ants, bees, hornets, etc. Know which students are allergic to stings and get medical help as soon as possible if the student is stung.

3. **Black widow and brown recluse spiders are found throughout Missouri.** The black widow spider is shiny black with distinctive red hour-glass shaped spots on the underside of the abdomen. Its bite creates severe discomfort but usually not death. The brown recluse is usually a grayish-yellow-brown, with a violin-shaped marking on top of the carapace. While death from a bite is unlikely, after several days a deep open wound will appear which is slow to heal and prone to infection. The free publication *Common Missouri Spiders* from the Department of Conservation has color pictures and information. Both of these spiders like dark places, and bites most frequently occur when a hand is placed under or inside an object.

4. **Ticks can carry disease, and bites can become infected.** Encourage protective clothing (hats, long sleeves, long pants tucked into shoes, no sandals) on field trips, and inspect for ticks after field work. Ticks in Missouri can carry (in order of incidence) Tularemia, Rocky Mountain Spotted Fever, Erlichiosis, and Borreliosis. These ticks are about the size of a sesame seed. Although there is a lot of attention given to Lyme disease, the CDC and Missouri Health Department state that 94% of all Lyme Disease is found in Northeastern United States and does not present a problem in Missouri. All these diseases can be treated with antibiotics. The Missouri Department of Health offers the free pamphlets *Questions and Answers About Lyme Disease* and *Tick Facts*.

# Safety With Chemicals

Knowledge about the safety of a chemical or the combination of chemicals is of primary importance before use in a classroom. Information is given about some common substances in this manual. For more complete facts, or for information for chemicals not listed, data is available from many sources including the chemistry teacher in your district or the supply company from which you purchase chemicals.

Flinn Scientific, Inc. Chemical Catalog/ Reference Manual, Sargent-Welch VWR Scientific, Fisher Scientific, and Frey Scientific companies all supply easily understandable hazard information or hazard codes by each chemical name in their catalogs. Addresses are listed on page 43. Feel free to call one of these companies or any other chemical supplier for specific chemical information. For detailed information, ask for Material Safety Data Sheets (MSDS) regarding the chemical you want to know about. Chemical suppliers are required by law to furnish MSDS for any chemical which may be hazardous, but may only do so if you actually buy the substance or request the MSDS.

Access to MSDS and safety information is readily available on the Internet from many sources including

**http://**
**www.sargentwelch.com/safetyck. html**
**www.Fisher1.com**
**www.Fisheredu.com**
or questions may be e-mailed to
**flinnsci@aol.com**

Flinn also plans to have a WEB site by fall, 1996, but the address was not available at the time of this manual publication.

Once chemical catalogs or MSDS are obtained, it is helpful to store all chemical information in a central location at a school so that teachers may share the resources.

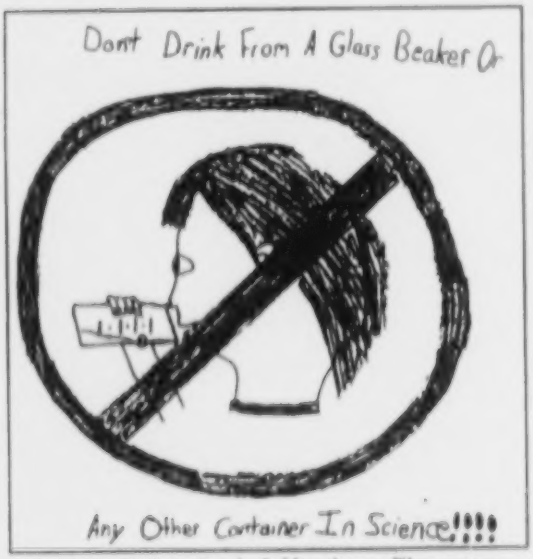
## General Guidelines

1. **Students and teachers should wear safety goggles when working with chemicals.** See page 31 regarding Missouri law. Even though the chemical may be considered safe, small children have a tendency to put their hands on their face or to rub their eyes, which may cause an irritation and burning.

Fritz Laun, Kindergarten, Shepard Blvd. Elementary, Columbia

2. **Hazardous chemicals are NOT recommended for use in the elementary science classroom.** Hazardous chemicals include **but are not limited to corrosives** (strong acids such as acetic, hydrochloric, sulfuric, or nitric, strong bases such as ammonia, sodium hydroxide, or ammonium hydroxide, chlorine, iodine crystals, etc.), **poisons** (mercury, lead, cadmium, cyanide, or arsenic compounds, etc.), **known or probable carcinogens** (arsenics,

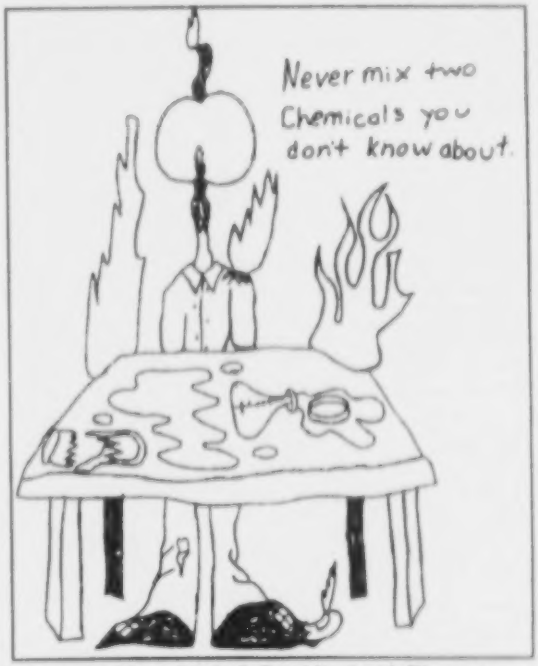
asbestos, benzene, chromium, chloroform, and others), **possible explosives** (ethyl ether), or **highly reactive chemicals** (such as sodium or potassium metals, some nitrates and nitrites, etc.). Special care should also be taken with **flammable chemicals** (such as acetone, alcohols, magnesium metal, etc.). This list is by no means definitive. The teacher is responsible for insuring that only low- or no-risk chemicals are used in the elementary classroom.




Anthony Barker, Grade 5, Hawthorne Elementary, Mexico

3. **Do not assume that a chemical is safe just because it is mentioned in an experiment in a textbook or elementary science resource book.** Texts from the last 3-5 years are generally very safety conscious, but earlier books did not always provide adequate safety information. For example, the *ammonium dichromate volcano* was a very popular demonstration, but chromate has been listed by the EPA as a carcinogen since 1981. This ion is present in ammonium dichromate and in the products produced by the volcano reaction. *Ammonium dichromate is not recommended for use in schools.* If this volcano demonstration must be done, it should be done in a functioning fume hood or outside with the students upwind of the demonstration. Goggles and gloves (latex kitchen gloves are acceptable) should be worn by anyone handling ammonium dichromate.

4. **Always try an experiment with chemicals before the students do it.** Accidents do happen, and the prior experience will help teachers be prepared.




Justin McNew, Grade 5, Franklin Smith Elementary, Blue Springs

5. **Use the safest chemical and the smallest amounts possible.** For example, white vinegar or lemon juice may often be substituted for equal amounts of weak solutions of hydrochloric or other acids. Baking soda may replace bases such as ammonium hydroxide or sodium hydroxide (lye). This substitution will also help limit teacher contact with corrosive

acids and bases. Be sure to try the experiment first to determine if the alternate chemical will provide the same results.

6. **To dilute a strong acid or base, add ACID TO WATER or the BASE TO WATER. Do not add water to the strong acid or base.** Solutions often splash. This method produces a weaker solution sooner and less heat is produced. Even household ammonia (a fairly strong base) should be diluted before the students use it. Dilutions of very strong acids or bases should be made in heat-resistant containers. See the following chemical information section for more details.

7. **Have only the amount of chemicals needed for the class activity within the classroom.** Keep the main source elsewhere so the students do not have access to the extra chemicals. If chemicals must be stored in the classroom, they should always be kept in locked cabinets.

8. **Wash hands well with soap and water after using chemicals**. Clean work areas carefully.

9. **Suggestions for chemical storage:**

   a. **Keep chemicals in a locked central location, rather than in each classroom**. This prevents duplication of chemicals. Faster use will ensure a fresher supply. It is safer to use a cart than to carry chemicals. Students should not have access to the chemical storage area, for reasons of safety as well as of liability.

   b. **Store chemicals away from heat, sunlight, and water sources.**

   c. **Order no more than a one- or two-year year supply of a chemical.** Disposal of of old and/or unwanted chemicals is a major problem for schools. Most household chemicals such as vinegar, ammonia, and baking soda may be flushed down the sink drain. Small amounts of other acids and bases may be also be diluted and flushed down the sink drain. Keep the faucet running for several minutes to clear the pipes of the chemicals and to aid in further dilution. Contact the district science supervisor or a chemistry teacher for information about district guidelines for disposal of other chemicals.

   d. **Store chemicals by chemical family, and not in alphabetical order as some incompatibilities exist.** The chemicals listed in the following table may be safely stored in alphabetical order, except the strong acids (see acids in table) should be stored in a separate area. Nitric acid should be stored apart from everything else. For chemicals not listed, check a chemical supply catalog for suggestions, or ask a chemistry teacher for help.

   e. **Keep chemicals on wooden shelving if at all possible, as metal shelves are easily corroded by chemicals.** Store chemicals at or below eye level and no more than two deep on a shelf for safer access. Short rails or lips on the shelves help prevent roll-offs and are very important in earthquake areas. Be sure that all storage units are firmly attached to the wall. Special cabinets are available for corrosives and flammables.

# Chemical Information for Elementary Teachers

| Chemical Names | Comments |
|---|---|
| Acids | The common strong acids in chemistry classrooms are hydrochloric acid (muriatic acid), sulfuric acid, acetic acid, and nitric acid. As strong solutions, they are all very dangerous - severely corrosive to all tissues by inhalation, ingestion, or contact. Even weak solutions may be very irritating to tissues. Be very careful when diluting strong acids; wear goggles and protective clothing, ***always add acid TO water in a heat-proof container (such as Pyrex or Kimax glass).*** Mixing water and acid may create substantial amounts of heat. Be aware of the heat and the possibility of splashing. If acid burns do occur, rinse with water for several minutes. See first aid, page 38. Acids should be stored away from other chemicals, with nitric acid stored separately from acetic acid and other chemicals.<br><br>Vinegar or lemon juice can often be substituted for equal amounts of a dilute solution of the acid, but experimental trials are recommended. See vinegar information below. |
| Alcohols | *Ethyl alcohol or ethanol* is a dangerous fire risk; "denatured" means poisonous to consume. Be sure to store alcohols away from all heat sources. Alcohol burner fuels are usually ethanol. Pure alcohol burns with an "invisible" flame - add a pinch of salt to the alcohol so students can see the flame (the sodium in the salt burns with an orange flame and will not affect the alcohol). Don't substitute duplicating fluid for the alcohol. Most duplicating fluid contains heavy metal salts (such as lead salts), and unhealthy byproducts can be released into the air when the fluid is burned.<br><br>*Isopropyl alcohol* is rubbing alcohol, and the inexpensive brands purchased at discount stores work very well for elementary science experiments. It is a moderate fire risk, so keep it away from any flame or heat source. It is also toxic by inhalation or ingestion. When it gets old, it may become an explosive hazard. Order what you need and use it within 1-2 years.<br><br>*Methyl alcohol or methanol* (also known as "wood alcohol") is also a dangerous fire risk, and ingestion may cause blindness. |
| Alum | Alum may be aluminum potassium sulfate or aluminum ammonium sulfate and is easily available from the spice section of a grocery store. The aluminum ammonium sulfate form may be moderately toxic in larger amounts. Alum has a long shelf life as long as it is kept clean and dry. |
| Ammonia | Household ammonia is 10% or less ammonia, but normally needs to be diluted for student use. This base is toxic by ingestion and inhalation, both the liquid and the vapor are irritating, especially to eyes. Run water for several minutes if ammonia is poured down drain for disposal. Wear goggles. |

| | |
|---|---|
| Ammonium Dichromate | **Listed by EPA as a carcinogen and NOT recommended for use in schools.** This substance is toxic and is irritating to eyes and skin. If the volcano demonstration is still used, it should be done under a functioning ventilation hood or out of doors (keep the students up-wind and do not let them handle the reaction products). Goggles and gloves (kitchen-type latex are acceptable) are strongly recommended. |
| Ammonium Hydroxide | In concentrated solution, the liquid and vapor are extremely irritating to the eyes and respiratory system. This substance is toxic by inhalation and ingestion. *To dilute, add TO water.* If needed for classroom use, consider ordering weaker solutions of 1.0 Normal or 3 Molar (it is listed by that or even weaker concentrations in the chemical catalog). Try substituting baking soda, weak ammonia solutions, or a window cleaner containing ammonia whenever a basic solution is needed for an experiment. |
| Baking Soda | The chemical name is sodium bicarbonate. It is a possible substitute for stronger bases such as ammonium hydroxide or sodium hydroxide. If only small quantities are needed, purchase at the grocery store. |
| Baking Powder | This usually contains sodium bicarbonate, calcium phosphate, and corn-starch. It may have aluminum contamination if purchased at grocery store. |
| Boric Acid | Strong solutions are toxic by ingestion, dry forms are irritants to skin. In weak solution, as purchased over the counter, it is generally safe. |
| Calcium chloride | Be aware that heat is produced when it is mixed with water and the solution container may get hot. Use a heat resistant container for mixing. |
| Copper sulfate | This is also called cupric sulfate. The crystal form is toxic by inhalation and ingestion, and is a skin and respiratory irritant. Solutions are toxic by ingestion. |
| Epsom salt | This is magnesium sulfate. It can irritate the eyes and respiratory tract but is relatively safe; normal caution should be used. |
| Formaldehyde, formalin | **Formaldehyde is listed as a carcinogen by the EPA.** Formalin is a solution of formaldehyde, water, and methyl alcohol. If formaldehyde-preserved animals are used in class, the specimen should be washed in gently running water overnight to reduce student and teacher exposure. Use in a well-ventilated room. Specimens which are preserved with safer substances can be purchased from supply houses. Of the other possible preservatives, isopropyl alcohol, ethylene glycol, and sodium citrate are among the safest but can still cause skin irritations and be dangerous if ingested. Goggles and gloves should be required. |

| | |
|---|---|
| Iodine | As a crystal, it irritates skin and is corrosive to eyes. Inhalation of vapors or ingestion is very dangerous. Iodine stains hands and clothes. Tincture of iodine, which contains ethyl alcohol, is flammable. For classroom use, tincture of iodine may be diluted by half with water and should be stored in brown bottles. |
| Limewater | This is a calcium hydroxide solution. It has a poor shelf life so keep the container tightly closed. Buy limewater tablets to make fresh solutions if used often. |
| Moth balls or crystals | This is para-dichlorobenzene. It is a severe irritant to the eyes and respiratory tract and is toxic by ingestion. If used for melting and freezing demonstrations, be sure to have very good air flow and room ventilation. Try stearic acid as a safer substitute. |
| Moth flakes | This is naphthalene. It is toxic by ingestion, inhalation, and skin contact. It is a moderate fire hazard. If used for melting and freezing demonstrations, use small amounts, heat gently, and have good air flow and room ventilation. Try stearic acid as a safer substitute. |
| Phenolphthalein | This is a bright fuschia-colored indicator for bases of around pH = 10 (such as ammonia) or stronger. Phenolphthalein may be purchased from supply companies. An easier source for elementary teachers is to extract phenolphthalein from common laxatives (it will be listed on the label as an active ingredient). Grind 2-3 squares or tablets of the uncoated laxative (such as Ex-lax) into about 10 ml of rubbing alcohol; let the mixture soak for about 15 minutes. Drain off the liquid and use by the drop as an acid-base indicator. |
| Potassium permanganate | This is sometimes used with glycerin as a volcano demonstration. It is a strong skin irritant and can explode during heating. This is a common cause of eye accidents. When using this substance, make sure there is good ventilation and use eye protection. |
| Sodium hydroxide | This is lye. It is a corrosive solid and produces heat when added to water. It is very dangerous to eyes and skin. Goggles and gloves are required. Weak basic solutions can be made by the addition of only 1-2 pellets to 250 ml of water. If spilled on the skin, rinse with water for several minutes. Try substituting baking soda or a weak ammonia solution when a base is needed. |
| Vinegar | Vinegar contains about 5% acetic acid. White vinegar, made from grains, is usually preferred over brown apple cider vinegar because lack of color and sediment in the white vinegar makes experimental observations easier. |

# Field Trips

Field trips are excellent supplements to the classroom, providing an opportunity to teach ecological relationships and a respect for the environment. Field trips should be well planned with identified educational objectives. Local school regulations should be consulted before any trip off the school grounds is arranged.

1. **Teachers should visit the field site before taking students to the area** so that learning objectives and safety needs may be identified.

2. **Authorized trip waiver forms should be used to inform parents or guardians and secure permission for school trips.** This form should be signed and filed with the school for each student participating in the field experience. A school policy should be developed for students failing to return the form. The form should include information about the date, location, time, method of transport, attending adults, purpose of the field trip, and required student clothing. There should be a space for the parent to list special medical needs of the student, such as allergies to bee stings, poison ivy, or pollen. See a sample of a field trip permission form on the following page.

3. **Wear appropriate clothing.** If the trip is to an area where there could be a problem of weed poisoning or tick infestation, hats, long sleeves, long pants tucked into socks or shoes, and proper shoes (no sandals) should be required. Students should be inspected for ticks following the field experience.

4. **All transportation should be in school-sanctioned vehicles, driven by school-sanctioned personnel**. At least two vehicles should be taken on the field trip in case one is needed for emergency medical transport.

5. **Student/adult ratio should be evaluated for each field activity**. NSTA recommends adult/student ratios of no more than 1:10. More adults may be needed when visiting an open-space site, such as a zoo, park, or nature trail. It is helpful to have specific students "assigned" to an adult and have the students stay near that adult throughout the trip. Some schools provide color-coded name tags or t-shirts to make group identification easier.

6. **A first aid kit should be taken** on the trip for minor scratches and abrasions. Be familiar with first aid treatment for bites, stings, and allergic reactions.

7. **A cellular phone should be taken for emergency or informational contact.** The phone also helps to maintain contact between vehicles going to and from the field trip site.

8. **Rules for conduct should be established before taking the trip.** Use a buddy system. Do not allow radios or tape players. Decide whether snacks will be allowed. Have an adult at the back of the group to be the "clean-up" person.

9. **Avoid glass collection containers**, which may break and cause cuts and/or loss of specimens.

The Missouri Department of Conservation offers many free pamphlets to aid in identification of plants or animals in Missouri. Request the order forms for "Publications" and "Education Materials."

**A sample Field Trip Permission Form:**

Fourth Grade Nature Trail Field Trip

The purpose of this field trip through the Hannibal-LaGrange College Nature Trail is to learn more about the common trees of Missouri and to collect common leaf samples from Missouri trees to use in an art-science project. There is no charge for this field trip.

**Date**: October 19, 1997 **Time**: 12:30 to 1:45 pm
**Meeting place**: Classroom
**Location**: Hannibal-LaGrange College Nature Trail

**Adult leaders**: Judy Lemons, teacher, Art Suchland, Missouri Conservation State Forester, and three parent volunteers
**Method of transportation**: school bus to the college
**Emergency phone number:** (573) 221-3675 (college) or cellular phone (573) 221-0000

**Suggested clothing**: comfortable shoes (no sandals), socks, long pants, long-sleeved shirt, hat
**Student materials**: magazine or catalog for pressing leaves as they are collected and pen or pencil to write the names of the collected leaves.

**********

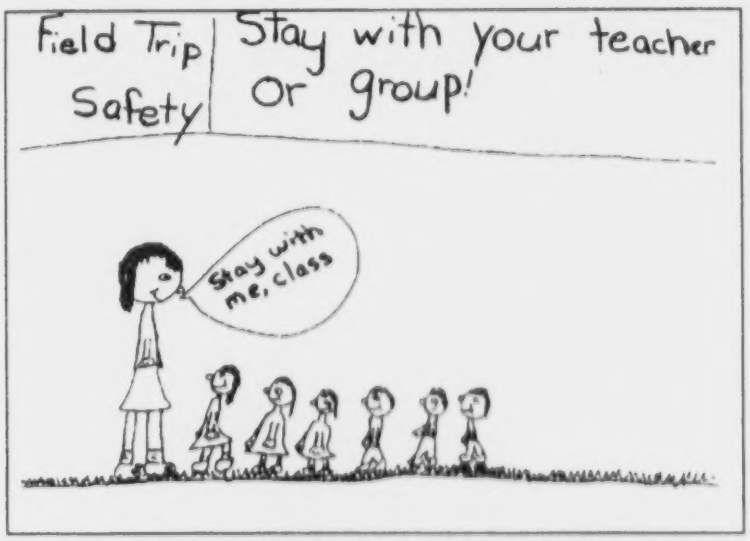
Permission Slip for Fourth Grade Field Trip

_____ has permission to go on the Fourth Grade field trip to the Hannibal-LaGrange College Nature Trail on October 19, 1997. **

_____ _____
Date Parent or Guardian

Please list any special medical needs of the student, such as allergies to poison ivy, bee stings, etc. Thank you.

[**A disclaimer of liability may be included here if recommended by the school field trip policy.]




Julie Bennett, Grade 3, Franklin Smith School, Blue Springs

# Safety Equipment

**The teacher's primary responsibility is to protect the students from injury.** Teachers should plan ahead to help ensure student safety in the event that there is an accident. Share the responsibility of dealing with accidents with the students. It is a good idea to assign specific students the responsibility of getting the school nurse and/or principal in case of an accident, just as students are assigned for other weekly responsibilities. Students must also share in the responsibility for maintaining safe behaviors. Have "safety monitor" as one of the assigned roles in cooperative grouping.

Teachers should *never* leave the class unattended while going for help. Protection of school property ranks below protection of students and is the responsibility of other personnel in the event of an accident. Do what is needed to keep the students calm and safe, and send a responsible student for help if needed.

Claire Bettale, Grade 4, St. Bernadette, St. Louis

## Specific Safety Equipment

Elementary classrooms are not always well supplied with safety equipment, but the basics should be available on a mobile basis if not a permanent part of the classroom. If a room is used only for science, administrators should be made aware of the safety needs from a view of potential liability. School insurance companies are often very helpful in promoting the purchase of safety equipment.

1. **Safety goggles.** Goggles are required by Missouri law (Section 170.005, RSMo). This law requires that American National Standards Institute (ANSI) approved safety goggles be worn by the student and the teacher in any possibly hazardous situation. While few elementary science experiments are done where there is a possibility of heating or splashing chemicals, the major problem with the elementary students is the tendency to rub their eyes. Even a "safe" chemical may cause irritation of these delicate tissues. Working with any sharp object may also be an eye hazard. Goggles are available in small sizes, and a classroom set might be kept in the library to be checked out when needed. Approved ANSI goggles will have "Z87" stamped on them. *Prescription glasses and contact lenses are not substitutes for safety goggles.* Larger safety goggles will fit over most glasses.

**Guidelines for cleaning goggles**

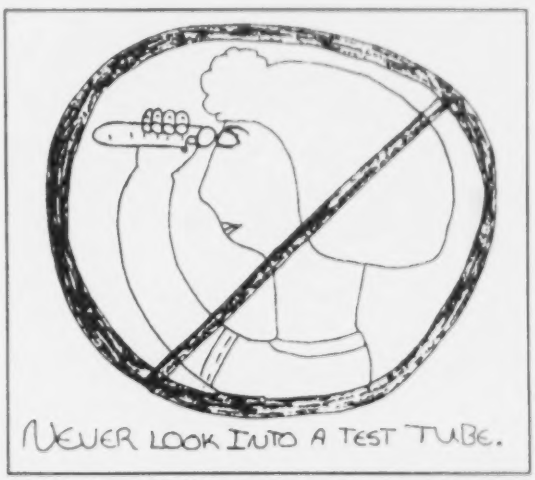
**Some type of disinfection of safety goggles should be done between each student use.** Few elementary schools have ultraviolet cabinets available for sanitizing safety goggles. The Missouri Department of Health, Bureau of Communicable Disease Control, recommends the following alternative for the cleaning and disinfection of goggles:

a. Mix one tablespoon of household bleach (5.25% hypochlorite) with one quart of water. This solution equals 800 ppm available chlorine and needs to be made fresh daily.
b. Clean the frame and lenses of the goggles with a few drops of liquid detergent on a paper towel. Rinse the goggles well with water and wipe the goggles partially dry with a paper towel.
c. Dip the goggles into the bleach solution OR wipe them with a cotton ball or gauze pad saturated with a 70% isopropyl alcohol (rubbing alcohol) solution. Let the goggles air dry.
d. Additional care is needed if a student has an obvious infection of the eyes (or has had an eye infection within the last 10-14 days), face, scalp, or hands, is known to be a carrier of a disease transmitted by blood or serum, or has an upper respiratory infection of the nose or throat. The student should wash his/her hands for at least 30 seconds prior to and after cleaning the goggles. The goggles should be immersed in the chlorine solution for 10 minutes following the initial cleaning with liquid detergent as described in step (b). This chlorine solution should be discarded, with a fresh solution used for other students.

For similar disinfection reasons, *blindfolds* should be washed between each use. While head lice should not be a problem if the school is enforcing the recommended no-nit policy, lice may be killed by washing any cloth article in hot water at 55°C or 131°F for 20 minutes.

2. **First aid kit.** If school policy permits, it is helpful to have a limited first aid kit in the classroom and to take on field trips. It should contain sterile gauze pads to help stop bleeding until medical help arrives, disposable gloves to help limit exposure to any body fluids, and possibly band-aids, antiseptic wipes, tape, and a first aid cream. See page 34 for further first aid information.

3. **Eyewash station.** Every room using chemicals should have some type of eyewash station. If that is not possible, it is important to have some large container of clean water available to begin washing a chemical from the eyes within 15 seconds. See page 38 for basic first aid for eye chemical burns.




Keri Stathem, Grade 5, Hawthorne Elementary, Mexico

4. **Broom and dustpan.** Have a broom and dustpan available to sweep up broken glass and a special container to hold all broken glass until the janitor removes it. Use damp cotton

or damp paper towels to gather up the very small glass pieces.

5. **Fire policies and equipment.** The best policy for avoiding a fire in the classroom is to avoid use of open flames for activities. An ABC multi-purpose type fire extinguisher should be available in case of a fire, but the priority of teachers is to remove students from the area of the fire. Let experienced personnel use the fire extinguisher. Without training, it is very easy to spread a fire instead of putting it out. *It is helpful to have a bucket of sand available for small fires.* The sand helps to smother the fire and will help contain any water poured on the fire. Some states require fire blankets (wool, NOT asbestos) in schools, though Missouri does not. If a student's clothing or hair catches on fire, the student may be rolled in the blanket. However, there is a concern regarding synthetic clothing and fire blankets. Synthetics will melt more than burn, and a blanket will hold this heat next to the skin. Rolling the student on the floor is still an acceptable method of putting out clothing fires, and a fire blanket may be used with discretion. Older students may benefit from practicing the "stop, drop, and roll" procedure.

**In case of a fire**

A. Aid any student whose clothing or hair is on fire; send designated student(s) to get help.

B. If materials in the room are on fire
   (1) Move students from the fire area.
   (2) Quickly determine the immediate and possible danger from the fire. Sound the fire alarm if there is a possibility of the fire spreading or representing any danger.
   (3) Obtain the personnel needed to put out the fire.
   (4) Remember that the safety of the students is the teacher's priority. Leave the fire fighting to the experts.

Leah Brendel, Grade 4, Greenwood Elementary, Greenwood

**Fire Prevention Education**

Many local fire departments are very willing to come to schools to present fire prevention programs. Some have "Stay Alive Houses" which they will bring to schools as a hands-on demonstration of ways to escape a burning building. The Gas Appliance Manufacturers Association (GAMA) in cooperation with the Consumer Product Safety Commission and the National Fire Protection Association (addresses on page 43) have free student booklets to provide and reinforce fire safety information for elementary students.

# FIRST AID

First aid is the immediate care given to a person who has been injured or suddenly becomes ill. Its purpose is not to treat but to protect, and it is used when medical help is not immediately available. A teacher has a responsibility to know what to do if a student is injured or becomes ill while under the teacher's care. *First Aid: Responding to Emergencies* (stock #650005) from the American Red Cross is an excellent reference and is available from local chapters. The Missouri Department of Health also has a *Recommended Procedures for Emergency Care of Illness and Injuries* flip chart which was specifically developed for school use. (See page 43 for address)

A first aid course with CPR training should be a priority for teachers. The Missouri Department of Health strongly recommends that at least one and preferably two members of a school's permanent staff receive formal first aid and emergency training. The Missouri Good Samaritan Law offers limited protection for those who are trained in recognized first aid and CPR programs.

## In Case of an Accident

**It is essential to obtain medical help in every case of serious injury or illness, in all cases of injury to the eye, and whenever in doubt. A teacher should not diagnose, treat, or offer medication, but may offer the necessary first aid until medical help is obtained.**

1. **Keep calm.** Keep others from crowding the injured student.

2. **Send the designated students for the school nurse (if your school has one) and/or the principal.**

3. **Restore breathing.** Use mouth-to-mouth respiration, CPR, or a method to stop choking *if you have had appropriate training.* It is possible to cause further damage to the student, which is why first aid training is vital.

4. **Stop any bleeding by applying a light pressure.** See page 39.

5. **Prevent shock.** Have the student lie down, cover him/her with a blanket (a clean fire blanket is fine), elevate the feet a few inches if the face is pale and there are no head, neck, or chest injuries. *Symptoms of shock* include cold or clammy skin, pale face, chills, increased pulse, nausea or vomiting, and shallow breathing. Don't give the student anything to drink or eat.

6. **Contact the parent or guardian as soon as possible.** Good communication will increase understanding and limit additional complications.

7. **File an accident report whenever there is any injury to a student and/or property damage.** Keep a copy of the report which has been signed by an administrator for your files.

## The Handling and Disposal of Body Fluids

**Many infectious agents may be found in the blood and body fluids of humans, even if there is no outward symptom of infection.** Routine safety procedures should be adopted by everyone in contact with blood, semen, drainage from scrapes and cuts, feces or stool, urine, vomitus, respiratory secretions, and saliva. Follow your school policy regarding the handling and disposal of body fluids. The

following general guidelines may also be helpful.

**Handling Body Fluids**

1. **Avoid direct skin contact with body fluids**. Persons with any open skin lesions should take particular care to avoid direct exposure of the lesions to body fluids. If it is not possible to avoid contact, wash hands vigorously for 10-15 seconds with a disinfecting soap and running water.

2. **Use disposable gloves when direct hand contact with body fluids is necessary.** For example, a student with a bloody nose or cut should be handed a paper towel or tissue until gloves can be put on. Latex or vinyl gloves are good, and are available from some science laboratory catalogs or any medical or dental supply house. The disposable gloves should be removed without soiling the hands and should be disposed of in an impervious plastic bag. If reusable rubber gloves are used, they should be washed with soap and running water prior to removal.

3. **Keep gloves in accessible locations.** This includes teachers' desk drawers, first aid kits, the school office, and health offices.

4. **After removing gloves, wash hands for 10-15 seconds with a disinfecting soap and running water.**

5. **Clean any surface which has been in contact with the fluids with an EPA-approved disinfectant such as Lysol or a freshly made 1:10 dilution of household bleach** (made by using one part bleach to ten parts of water).

**Caution:** Any EPA-approved disinfectant used should be diluted according to the manufacturer's instructions. It is not appropriate or necessary to add more disinfectant than the directions indicate. Doing so will make the disinfectant more toxic and could result in skin damage to those individuals using it. A diluted bleach solution should not be mixed with any other chemicals as a toxic gas may be produced.

**Disposal of Body Fluids and Cleanup Supplies**

Gloves, paper towels, absorbent floor sweep material, and other supplies used in the cleanup should be disposed of in a closed plastic bag. According to the Centers for Disease Control, infective waste should be either incinerated or autoclaved (sterilized by heat) before disposal in a sanitary landfill. Your janitor should be familiar with the procedure for your district.

For current facts on AIDS, contact the Missouri Bureau of AIDS Prevention at 1-800-533-2437, the Missouri Department of Health at (573) 751-6400, or the National AIDS Hotline at 1-800-342-2437. The National Hotline also offers classroom conference calls through which student questions may be answered. These calls should be arranged with the Hotline in advance so that the education specialist will be available.

## Poison Control

The best method of dealing with the problem of poisonings is prevention. According to data from the American Association of Poison Control Centers, about 3,000,000 poison exposures will occur in the U.S. in the next 12 months; 1.0% or about 30,000 will happen in schools. The poisons involved include cleaning substances, plants, bites and stings, pesticides, etc.



BEST COPY AVAILABLE

**Suggestions for poison prevention**

1. Keep all poisonous substances (chemicals, cleaning supplies, plant chemicals, etc.) in locked storage, preferably away from the general classroom.

Aaron Long, Grade 3, St. Clair Elementary, St. Clair

2. Any poison container which may ever be used in the classroom should have a "Mr. Yuk" sticker (or one of your own design) so that young students may easily identify dangerous substances.

3. Carefully read the Manual sections regarding poisonous plants and animals.

4. Keep emergency numbers posted. If you do call a hospital or poison control center, it will help if you know the victim's age, weight, the poison involved (if possible, have the label with you when you call), if any first aid has been given, if the victim has vomited, and how long it will take you to get to the hospital. Remain calm.

**Poison education**

Cardinal Glennon Children's Hospital in St. Louis, 1-800-366-8888 or (314) 772-5200, is the central information center for the Missouri Poison Control System. As a Regional Poison Center, Cardinal Glennon has informational pamphlets, "Mr. Yuk" stickers with emergency telephone numbers, and the "*Power Over Poison*" Prevention Resource Program for first grade teachers. This program includes a videotape for teacher background, a children's quiz show videotape, poison flash cards, an audiocassette of the "*Power Over Poison*" song, a poster, and other materials. The cost for the total program is $100.00, with individual program items also available. For more information contact:

Regional Poison Center
Cardinal Glennon Children's Hospital
1465 S. Grand Blvd.
St. Louis, MO 63104
ATTN: Barb Austermann or Pat Seratti

Another program is *Poison Prevention Week*, which is sponsored by the Consumer Product Safety Commission. The Commission offers a variety of brochures, posters, and AV materials. There is a charge for some materials, but many are free. For more information contact:

Poison Prevention Week Council
P.O. Box 1543
Washington, D.C. 20013

## FIRST AID RESPONSE

**For any but very minor injuries, send the designated students for the nurse and/or principal.**

**POISONING**

**Toxic substances may enter the body by inhalation, ingestion, injection, or skin contact.** If a poisoning occurs and medical assistance is not immediately available, call Cardinal Glennon Children's Hospital for help.

Syrup of ipecac should always be available from the school office or nurse, but should be used only on the advice of the Poison Control Center or physician.

The person calling for medical assistance should know the age of the victim, the name of the poison and amount taken or the general nature of the toxic substance, the first aid being given, whether the victim has vomited, the location of the victim, and the time it will take to reach medical help.

**Inhaled Poisons**

1. Call for medical assistance.

2. Carry the victim to fresh air if possible. If the victim is too large to carry or has other injuries, open all doors and windows.

3. If the victim is not breathing, trained personnel should immediately begin artificial respiration. Care should be taken not to inhale the victim's breath.

4. Treat the victim for shock until medical assistance arrives.

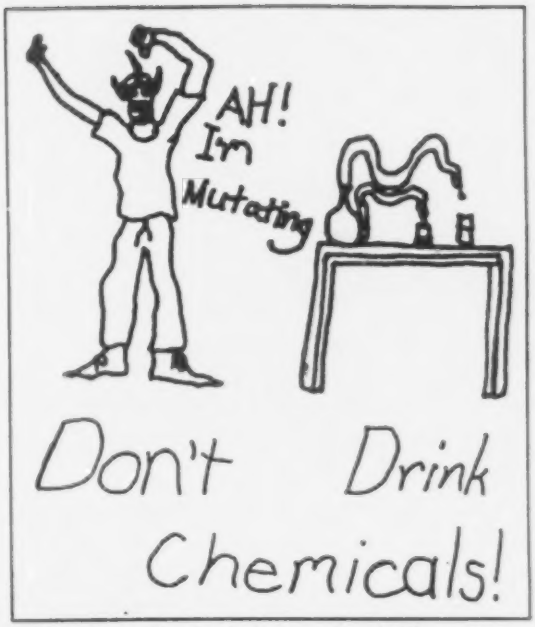
**Ingested Poisons**

1. Call for medical assistance.

2. Maintain the victim's breathing.

3. Do not administer syrup of ipecac to induce vomiting, or water or milk for dilution of the poison, unless advised to do so by a physician or the Poison Control Center.

4. Take the container of poison to the medical facility.




Brian Reynolds, Grade 3, James Lewis Elementary, Blue Springs

**Injected Poisons**

Call for immediate medical assistance if any chemical substance is injected. See the following page for the section concerning bites and stings from animals.

**Skin Contact Poisons**

1. If contact is made with a plant poison (such as poison ivy oils), remove the contaminated clothing as soon as possible. Wear rubber gloves if you are helping a student. Immediately wash all exposed areas with large quantities of soap and water.

2. See the following sections about chemical burns of the skin and eyes.

## CHEMICAL BURNS - SKIN

1. Wash away the chemical with large amounts of water as quickly as possible and for at least 5 minutes.

2. Remove any clothing contaminated with chemicals; wear rubber gloves.

3. *Do not attempt to neutralize the chemical unless approved by medical personnel* and the chemical is first diluted with water. The skin is not the place for a chemical reaction.

4. Apply a sterile dressing (not cotton) and get medical aid.

## CHEMICAL BURNS - EYES

**Immediately send for an ambulance so that first aid will not have to be discontinued during transport to medical attention. This is especially important for strong alkali (such as sodium hydroxide) burns.**

1. As quickly as possible, begin thoroughly and gently washing the affected eyes, eyelids, and face for 15 minutes.

2. If the student is wearing contacts, they should be removed if possible. In either case, continue washing the eyes with water.

3. If an eye wash station is not available, have the student lie down with his/her head to the side, and while holding the eyelid open pour lukewarm water from the inner corner of the eye outward. Make sure the chemical does not wash into the other eye. It is a good idea to have clean bottles of water in the classroom which are saved for this specific purpose. If the eyewash station or hose is attached to a regular faucet, make sure the water is not too cold or too hot or under too much pressure.

4. Cover the eye with a dry, clean dressing (not fluff cotton). Caution the victim not to rub the eye.

5. Get medical help immediately for any eye injury.

## HEAT BURNS

### Minor Burns

1. Place the burned extremity into cold water or apply clean, cold, moist towels. Do not use ice or salt in the water. Maintain treatment as long as pain or burning exists.

2. Apply a clean, dry dressing if needed. Ointments and salves prevent the release of heat from the skin, and should not be used unless prescribed by a physician.

### Major Burns

1. Lay clean towels over the area and pour cold water over the towels. Do not add ice or salt to the water.

2. Gently blot the area dry. Do not break blisters, remove tissue, or apply any ointments, sprays, or salves.

3. Cover the burned area with a clean, dry cloth to protect it. If arms or legs are affected, keep them elevated.

4. Seek immediate medical care.

## ELECTRICAL BURNS AND SHOCK

1. Disconnect the power source if possible or pull the victim away from the source using dry wood or a length of dry cloth. Make sure the

rescuer has dry hands and is standing on a dry floor. Do NOT use a conducting material such as a metal object to attempt to remove the victim from the power source.

2. Maintain breathing.

3. Treat for shock symptoms (keep victim lying down, cover with blanket, elevate feet a few inches if no chest or head injuries).

4. Seek medical help as soon as possible. All electrical burns should be evaluated by a physician.

## SEVERE BLEEDING

1. Send for emergency medical help and transport.

2. If possible, put gloves on. Place a thick pad of clean cloth directly over the wound and press firmly with the palm of the hand to control blood flow. Do not apply a tourniquet unless you are trained to do so, and as a last resort to stop bleeding.

3. Do not disturb blood clotting by removing saturated cloth; apply additional layers.

4. Do not use any topical medications.

5. Treat for shock until medical help arrives.

## BITES AND STINGS

### Snake Bites

**If possible, identify the snake which bit the victim. Antivenom is species specific.**

1. Keep the victim calm and as quiet as possible, with the bitten area at or below heart level if possible. For example, if the hand is bitten, keep it lowered at the side of the body, not high up on the chest.

2. Transport to a hospital or medical aid promptly.

3. If the hospital can be reached within an hour and no symptoms develop, no further first aid is necessary until the victim arrives at the hospital.

4. Do NOT use constricting bands unless medical help is more than an hour away and mild to moderate symptoms such as pain and swelling occur. Check a pulse in the extremity to be sure all blood flow has not stopped. Incision/suction is not recommended. If severe symptoms such as paralysis or loss of consciousness occur, apply a tourniquet, elevate the extremity, and keep the victim quiet. If you are going to be in an area where snakebite is possible and medical help is distant, contact the local Red Cross for training in the use of a snake bite kit.

5. Do not administer aspirin, sedatives, or apply cold compresses or ice.

6. Notify the parents of the victim regarding the bite.

### Spider Bites

1. If a person is bitten by a black widow or brown recluse spider, seek immediate medical attention. Keep the victim calm, quiet, and warm. Do not apply ice.

2. Other spider bites generally need no treatment other than the application of a soothing lotion such as calamine. However, the student should be observed for any reaction and parents should be notified.

### Ticks

1. Attached ticks should not be removed by teachers because of medical legal liability. The parent or guardian should be contacted. The parent or guardian or physician of their choice has the responsibility for removal of the tick.

2. If the victim becomes ill within a week of a tick bite, or other symptoms develop in the bite area, the parent/guardian should contact medical help. See page 22 for more information on tick diseases.

### Stings

**Be aware of student allergies. Get immediate medical help if the student has a history of allergies to stings from wasps, bees, hornets, or yellow jackets.**

1. Use ice wrapped in cloth or cold compresses to relieve pain and swelling.

2. Keep the student as quiet as possible.

3. Do not PULL the stinger out, instead, remove it with a scraping motion with a fingernail or plastic card to reduce toxin injection.

4. Wash the area thoroughly with soap and water, ice may be applied intermittently to reduce pain and swelling. A paste of baking soda or a soothing lotion such as calamine may also be applied to help relieve the pain.

5. Any sting to the throat, mouth or tongue should receive immediate medical attention as swelling of these areas can cut off passage of air.

6. **An allergic reaction to a sting requires immediate emergency medical treatment.** This reaction may be indicated by complaints of abdominal cramps and nausea, coughing, tightness in the throat or chest, swelling and itching of the eyes, or by paleness of skin or excessive sweating.

### Mammal Bites

**There is danger of infection and rabies from bites of all warm-blooded animals.**

1. Wear gloves if possible while cleaning the wound. Wash the wound area thoroughly with a warm soap or detergent solution for several minutes.

2. Apply a bandage if needed.

3. Notify the student's parents or guardians in case follow-up medical treatment is needed.

4. Medical history should be shared if the bite was from another child.

5. Any animal that has bitten a child must be caught and observed for rabies. According to the Missouri Department of Health, the authority responsible for catching, transporting, and caring for the animal varies by city or county. The local police, sheriff, or humane officer should be contacted so that appropriate action may be taken.

# Legal Aspects of Science Safety

**The teacher, district science specialists, and administrators are legally responsible for the safety of the student in the science classroom.** In recent years, there has been increasing concern regarding liability in relation to any student injury. The legal principles involved are part of *tort law*. *A tort* is a wrongful act causing damages which may give rise to a civil suit. If a person is injured, these are often called personal injury cases.

Concern arises when the torts are based on an allegation of *negligence*. Negligence is defined in *Black's Law Dictionary* as "the omission to do something which a reasonable man, guided by those ordinary considerations which ordinarily regulate human affairs, would do, or the doing of something which a reasonable and prudent man would not do." The Dictionary states that "one is not 'negligent' unless he fails to exercise that degree of reasonable care that would be exercised by a person of ordinary prudence under all the existing circumstances in view of probable danger of injury."

The law basically requires teachers to be reasonable and use good common sense. Teachers are required to exercise the skill and training which would ordinarily be expected from someone in their profession. In the classroom, this requires an understanding of the substances and materials the teacher and the students will be using, whether it is a chemical or combination of chemicals, animals, plants, or lab equipment. This manual cannot list all possibilities of problems, but may serve as a baseline for further research. Teachers must gather the information needed to reasonably assess the risk versus the benefit of any activity. As professionals, teachers must provide a healthy and safe environment in the classroom.

## General Safety Guidelines

1. **Never leave the students alone in the classroom.** If a teacher must leave, have another adult come in to supervise. Plan activities so that there is no need to go to the storeroom for additional supplies. Carefully select activities done with substitute teacher supervision.

2. **Wear safety goggles as required by law in Missouri.** The teacher, students, and any visitors are required to wear safety goggles any time they are in the classroom with caustic chemicals, hot liquids or solids, and other listed dangers, as well as for "other hazards not enumerated" (Section 170.005, RSMo). Prescription glasses and contact lenses are not substitutes. See page 31.

3. **Be prepared.** Always try an activity before you do it in class. Read about the animals, plants, chemicals, or equipment that will be used. Ask other teachers for safety suggestions.

4. **Keep all chemicals and possible poisons in locked storage.** This includes insecticides, animal medicines, etc. Have only the amount of chemical needed for the activity in the classroom. Do not allow student access to the storage area.

5. **Use chemicals that present the least risk possible for elementary students.** No poisons, explosives, strong corrosives, carcinogens, or other hazardous chemicals should be used.

6. **Share safety responsibilities with the students.** Have designated students res-

ponsible for contacting the school nurse and/or principal in case of an accident. Discuss and practice accident response. Reinforce the need for safe behaviors during science activities. Give safety instructions before each activity, as related to that specific instance.

7. **Inventory the classroom for safety.** Have plans for two possible exits, know where a fire extinguisher may be located (usually for other personnel to use so the teacher may protect the students), have clean lukewarm or room temperature water available for chemical burns (consider keeping clean gallon bottles of water in the classroom), have a basic first aid kit in the classroom. Have a special container for broken glass, check all equipment for safe wiring, chips, cracks, etc.

8. **Be trained in first aid and CPR.** It is recommended that teachers take a recognized first aid training program so that immediate care may be given to a person who has been injured in the classroom.

The Missouri Good Samaritan Law (Section 537.037, RSMo) offers limited protection from ordinary negligence in some situations if the assisting person has been trained in a recognized training program.

9. **Always file written accident reports with the administration as soon as possible following any accident in the classroom.**

10. **Be aware of any students with allergies.** Try to limit the student's contact with the allergen, whether in the classroom or on a field trip. Be familiar with the necessary first aid treatment.

# Sources of Information

AIDS Prevention Hotline
1-800-533-2437 (Missouri)
1-800-342-2437 (National)

Fisher Scientific Educational Materials Division
485 S. Frontage Road
Burr Ridge, IL 60521
1-800-955-1177
http://www.Fisher1.com
(chemical safety information)

Flinn Scientific, Inc.
Chemical Catalog/Reference Manual or Biological Catalog
P.O. Box 219
Batavia, IL 60510-0219
1-800-452-1261
flinnsci@aol.com
(chemistry or biology safety information)

Frey Scientific
100 Paragon Parkway
Mansfield, Ohio 44903
1-800-225-3739
http:// www.WorldWideMedia.com/ wwmedia/
(laboratory safety information)

GAMA Safety Program
Rt. 480 & Central Ave.
Ridgely, MD 21660
(fire safety)

Judith Lemons, Ph.D.
Hannibal-LaGrange College
2800 Palmyra Road
Hannibal, MO 63401
(573) 221-3675, ext. 241
jlemons@nemonet.com
(general MO science safety)

Missouri Department of Conservation
Conservation Education Unit
[Tim Smith, State Botanist]
P.O. Box 180
Jefferson City, MO 65102-0180

Missouri Department of Elementary and Secondary Education
CJ Varnon, Science Curriculum Consultant
P.O. Box 480
Jefferson City, MO 65102
(573) 751-4445

Missouri Department of Health
Bureau of Family Health
P.O. Box 570
Jefferson City, MO 65102
(573) 751-6400

Missouri State Poison Control Center
1-800-392-9111

National Association for Humane and Environmental Education
P.O. Box 362
East Haddam, CT 06423-0362
(203) 434-8666

National Button Battery Ingestion Hotline
(202) 625-3333

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269
1-800-344-3555

National Science Teachers Association
1742 Connecticut Ave., N.W.
Washington, D.C. 20009
(703) 243-7100
http://www.nsta.org/

Poison Prevention Week Council
P O Box 1543
Washington, D. C. 20013

Regional Poison Center
Cardinal Glennon Children's Hospital
1465 S. Grand Blvd.
St. Louis, MO 63104
1-800-366-8888
(314) 772-5200

Sargent-Welch VWR Scientific
911 Commerce Court
Buffalo Grove, IL 60089-2375
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